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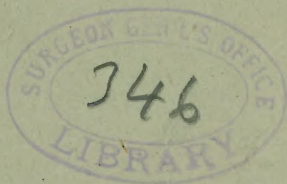
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BY

A. JACOBI, M.D.,

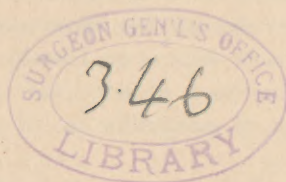
PRESIDENT OF THE NEW YORK ACADEMY OF MEDICINE.





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## THERAPEUTICS OF DIPHTHERIA.

By A. JACOBI, M.D.,

PRESIDENT OF THE NEW YORK ACADEMY OF MEDICINE.

[Read May 23, 1888.]

MR. PRESIDENT: You have conferred upon me the honor of an invitation to make some introductory remarks to your discussion on the treatment of diphtheria. This invitation I was anxious to accept, if for no other reason than to see the profession of Philadelphia at their home and at work. That I should bring anything new or striking to you, I never for a moment believed, since I have always been in the habit of reading your books and journals and the proceedings of your societies. But it pleased me to infer from the demand that I should appear before you, that I was, to a certain extent, considered one of you, and to prove by my willingness to come that I appreciated the honor offered.

When I considered the subject which is to be the topic of your deliberations this evening, and remembered the vastness of its literature, it became clear to my mind that a digest, ever so small, of what has been written, would fill more than many evenings, and still fall short of accomplishing the object in view. I was aware that I must not come here with literature. You will excuse me, therefore, for only detailing in plain language some of the facts gathered in my contact with diphtheria these thirty years, and the therapeutical measures which I have learned to appreciate and to practise. Thus, I shall not touch upon the large number of panaceas which have ascended like rockets and never were seen again.

Diphtheria is a contagious disease. Severe forms may beget severe or mild forms. Mild cases may beget mild or severe cases. There is probably no spontaneous origin of diphtheria, any more than there is a spontaneous origin of cholera or scarlatina. What has been called follicular amygdalitis (or "tonsillitis") is diphtheria in many, perhaps most, instances. It is seldom dangerous to the patient, because the tonsils have but very little lymph communication with the rest of the



body. But the diphtheritic variety of follicular amygdalitis also is contagious. This mild variety is that from which adults are apt to suffer. It made me proclaim the warning that there is as much diphtheria out of doors as there is in doors; as much out of bed as in bed. With this variety the adult is in the street, in business, in the school-room, in the railroad car, in the kitchen and nursery. With this variety, parents while complaining of a slightly sore throat, kiss their children. Wherever it is suspected, it ought to be looked after. Where it is seen, it ought to be isolated and treated, less perhaps for the sake of those who are sick, than of those who are in serious danger of being infected. This is the more necessary, as this form is apt to last long and give rise to repeated attacks. But it is not only the mild variety which is liable to last long. Serious, undoubted cases are also apt to last for weeks, and some of them months. As long as they do persist they are contagious.

These reminiscences and quotations from former writings must justify the preëminent place I claim for preventive treatment.

Those sick with diphtheria, severe or mild, must be isolated. If barely possible, the other children ought to be removed from the house. This can but rarely be done in the homes of the poor, in the densely populated districts. A great charity is still waiting for its consummation, viz., that of erecting buildings, dormitories, and playrooms for those who ought to be temporarily exiled from their infected homes. A suggestion of mine, before the New York State Medical Society at its meeting of 1882, resulted in the erection of the Willard Parker Hospital of New York, for the benefit of those suffering from scarlatina and diphtheria. The erection of a sufficient number of temporary homes would be a still greater blessing to the poor, and a greater protection to the public at large. If it be impossible to send the well children away, let them remain outside the house, in the air, as long as feasible, and with open bedroom windows during the night, in the most distant part of the house; during the winter on a lower floor. Their throats must be examined every day, and their rectal temperatures taken by the mother, so that the physician may be called on the occurrence of but slight changes. The few minutes spent in this way are amply repaid by the safety they may accomplish. The attendants upon cases of diphtheria must have no intercourse with the well children; though a brief visit of the physician may not render him sick, or dangerous to others, a long exposure affects him or a nurse to a greater or less degree.

The well children of a family in which there is diphtheria, must not

go to school or church. Schools must be closed when a number of pupils have been attacked; or, better still, when there is an epidemic, though it may not yet have affected the school children to a great extent; the teachers ought to be taught how to examine throats, and directed to do so every morning, and send home those children who are suspected.

When an attack of diphtheria has made its appearance, it is well enough to examine the hygienic condition of the house with its deteriorating influences on the general health of the inmates, and to look after the source of the case in the persons of friends, attendants, and help. A family with children ought to insist upon the occasional inspection of the throats of their servants; those with chronic pharyngeal catarrh must not be hired. A seamstress, or laundress, coming for an occasional day's work, sick nurses, children's nurses, and cooks, ought to be examined from time to time, the more so, the more such people are inclined to conceal slight troubles, for obvious reasons. The opportunities for infection are so numerous that it is impossible to sail absolutely free from it. It is easy to imagine how many cases of diphtheria are liable to be disseminated by teachers, shopkeepers, restaurants, barbers, and hairdressers.

In times of an epidemic, every public place, theatre, ball-room, dining-hall, and tavern ought to be treated like a hospital. Where there is a large conflux of people there are certainly many who carry the disease. Disinfection ought to be enforced at regular intervals. In this respect I can but repeat what I said in my treatise (p. 172) and in Pepper's *Cyclopaedia* (I. 697). Public vehicles must be treated in the same manner after a suspicious case has been carried; that it should be so when a case of smallpox has happened to be conveyed in them, appears quite natural. Livery stable keepers, who would be anxious to destroy the germ of smallpox in their coaches, must learn that diphtheria is as dangerous a passenger as variola, and what is correct in the case of a poor hack, is more so in a railroad car, whether emigrant or Pullman. I have seen many cases coming to and leaving the city in them. They ought to be thoroughly disinfected in times of an epidemic at regular intervals, for the highroads of travel have always been those of epidemic diseases. Still, can that be accomplished? Will not railroad companies resist a plan of regular disinfections, because of their expensiveness? Will there not be an outcry against this despotic violation of the rights of the citizen, the independence of the money bag? Certainly there will be, exactly as there was when municipal authority commenced to compel parents to keep



their children from school when they had contagious diseases in their families, and when smallpox patients were arrested because of their endangering the passengers in a public vehicle, or taken to a fever hospital for the protection of their neighbors. In such cases it is not society, or the State, that tyrannizes the individual, it is the individual that endangers society.

To what extent the infecting substance may cling to surroundings, is best shown by the cases of diphtheria springing up in premises which had not seen diphtheria for a long time, but had not been interfered with; and best, perhaps, by a series of observations of auto-infection. When a diphtheritic case has been in a room for some time, the room, bedding, curtains, and carpets, are infected. The child is getting better, has a new attack, may again improve, and is again stricken down. Thus I have seen them die; but also improve immediately after being removed from that room or house. If barely possible, a child with diphtheria ought to change its room and bed every few days.

To other rules of protection and disinfection, both private and public, including the prohibition of public funerals, I allude, only for the purpose of referring to the admirable rules published by the National Board of Health, in its *Bulletin* No. 10, of September 6, 1879, and copied in my treatise on diphtheria, New York, 1880, and my article on diphtheria in Pepper's *System of Practical Medicine*, vol. i. p. 698.

Prevention can accomplish a great deal for the individual. Diphtheria will, as a rule, not attack a healthy integument, be this cutis or mucous membrane. The best preventive is, therefore, to keep the mucous membrane in a healthy condition. Catarrh of the mouth, pharynx, and nose must be treated in time. Many a chronic nasal catarrh, with big glands round the neck, require sometimes but two or three regular salt-water injections (1:130) into the nose, and gargling if the children be large enough to do so. The addition of one per cent. of alum will often be found useful. This treatment, however, must be continued for many months, and may require years. Still there is no hardship in it, and no excuse for its omission. The nasal spray of a solution of nitrate of silver, 1:500 or 1000, will accelerate the cure, and not infrequently has a treatment which was considered obsolete when I was young, been of great service to me. It consists in the internal administration of the tincture of *pimpinella saxifraga*. It is certainly an efficient remedy in subacute and chronic pharyngitis and laryngitis. I generally give it to adults, diluted with equal parts of glycerine and water, a teaspoonful of the mixture every



two or three hours, with the proviso that no water must be taken soon after.

Large tonsils must be resected in times when there is no diphtheria. During an epidemic every wound in the mouth is liable to become diphtheritic within a day, and such operations ought to be postponed if feasible. The scooping of the tonsils, for whatever cause, I have given up since I became better acquainted with the use, under cocaine, of the galvanocautery. From one to four applications to each side, or to the post-nasal space, are usually sufficient for every case of enlarged tonsils or lacunar amygdalitis. It is advisable to cauterize but one side at a time, to avoid inconvenience in swallowing afterward, and to burn from the surface inward. Cauterization of the centre of the tonsils may result in swelling, pain, and suppuration, unless the cautery is carried entirely to the surface; that means to say the scurf must be on, or extend to, the surface. Another precaution is to apply the burner cold, and heat it *in situ*.

Nasal catarrh and proliferation of the mucous and submucous tissue may require the same treatment, but in my experience the cases which require it are less frequent than those in which the tonsils need correction.

The presence of glandular swellings round the neck must not be tolerated. They, and the oral and mucous membranes, affect each other mutually. Most of them could be avoided, if every eczema of the head and face, every stomatitis and rhinitis resulting from uncleanness, combustion, injury, or whatever cause, were relieved at once. A careful supervision of that kind would prevent many a case of diphtheria, glandular suppuration, deformity, or phthisis.

For its salutary effect on the mucous membrane of the mouth, chlorate of potassium, or sodium, which is still claimed by some to be a specific, or almost so, is counted by me amongst the preventive remedies. If it be anything more, it is in a case of diphtheria an adjuvant. It exhibits its best effects in the catarrhal and ulcerous condition of the oral cavity. In diphtheria it keeps the mucous membrane in a healthy condition, or restores it to health. Thus it prevents the diphtheritic process from spreading.

Diphtheria is seldom observed on healthy, or apparently healthy, tissue. The pseudo-membrane is mostly surrounded by a sore, hyperæmic, oedematous mucous membrane. Indeed, this hyperæmia precedes the appearance of the diphtheritic exudation in almost every case. The exceptions to this rule consist of those cases in which the virus may take root in the interstices between the normal tonsillar

epithelia, pointed out by Stoehr but a few years ago. Indeed, many cases of throat disease occurring during the prevalence of an epidemic of diphtheria are but those of pharyngitis, which, under favorable circumstances, may develop into diphtheria. These throat diseases are so very frequent during the reign of an epidemic, that in my first paper on diphtheria (*Amer. Med. Times*, August 11 and 18, 1860) I based my reasoning on 200 cases of genuine diphtheria and 185 of pharyngitis, without a visible membrane.

These cases of pharyngitis, and such of stomatitis and pharyngitis accompanying the presence of membranes, are benefited by the local and general effect of chlorate of potassium. The surrounding parts being healthy or returning to health, the membrane remains circumscribed. The generally benign character of purely tonsillar diphtheria, which is apt to run its full course in from four to six days, has in this manner contributed to secure to chlorate of potassium the reputation of being a remedy, *the* remedy in diphtheria. The dose of the salt must not be larger than 15 grains (1 gramme) for an infant a year old, not over 20 or 30 (1.5-2) for a child from three to five years, in the twenty-four hours. An adult must not take more than 1½ drachms (6 grammes) daily. These amounts must not be given in a few large doses, but in repeated doses and short intervals. A solution of one part in sixty will allow a teaspoonful every hour, or half a teaspoonful every half hour in the case of a baby one or two years old.

It is not too late yet to raise a warning voice against the use of larger doses. Simple truths in practical medicine do more than simply bear repetition; they require it. For though the cases of actual chlorate of potassium poisoning are no longer isolated, and ought to be generally known, fatal accidents will still occur even in the practice of physicians. When I experimented on myself, with half ounce doses, thirty years ago, the results were some gastric, and intense renal, irritation. The same were experienced by Fountain, of Davenport, Iowa, whose death from an ounce of the salt has been impressively described in Alfred Stillé's *Materia Medica*, from which I have quoted it in my treatise on diphtheria. His death from chlorate of potassium induced me to prohibit large doses as early as 1860. In my contribution to Gerhardt's *Handbuch der Kinderkrankheiten*, vol. ii., 1877, I spoke of a series of cases known to me personally. In a paper read before the Medical Society of the State of New York in 1879 (*Med. Record*, March 15th), I treated of the subject monographically, and alluded to the dangers attending the promiscuous use



of the drug, which has descended into the ranks of domestic remedies; and, finally, in my treatise (New York, 1880) I collected all my cases, and the few then recorded by others. Since that time the recorded cases have become quite numerous, and but a few days ago a few new ones were related before the Practitioners' Society of New York. The facts are undoubted, though the explanations may differ. The probability is that death occurs from methæmoglobinuria produced by the presence of the poison in the blood; though Stockvis, of Amsterdam, has tried, by a long series of experiments, to fortify my original assumption that the fatal issue was due to acute nephritis.

The attempts at forming indications for the treatment of patients with diphtheria—I refuse to say treatment *of* diphtheria—based upon the preconceived or acquired idea as to the nature and causes of diphtheria, are all futile. We know that many cases are undoubtedly of local origin; but there are those in which we require no other proof of its original infectious character than the fact that there is a period of incubation. But all that is indifferent, in view of the fact that the cases we are called upon to treat are, as a rule, or have become, both local and constitutional. It is these we have mostly to deal with.

There is no better proof of the non-existence of a specific in diphtheria than the fact that the pharmacopœia has been exhausted to find one, and new remedies, legitimate and illegitimate, are being recommended all the time as panaceas. While there are certain indications resulting from the characteristics common to all, every case must be treated on general principles, which must be applied to the prominent individual features. When there is a high temperature in the beginning, it requires all the tact of a good physician to judge of the advisability of reducing it by antifebriles, such as sponging, warm bathing, cold bathing, antipyrin, antifebrin, or the subcutaneous use of the carbamide of quinia. Convulsions may demand active treatment, such as chloroform inhalations, or chloral hydrate internally or in the rectum. Vomiting, or other cerebral symptoms, may ask for liquids, or smaller or larger doses of opiates. A very quick and feeble pulse may require a few large doses of a heart stimulant, digitalis, strophanthus, or spartein, in the very beginning.

Renal complications are frequent and occur at an early time. The majority of cases terminate favorably, in some a large amount of albumin will be eliminated in the course of a few days and disappear shortly. But whether your individual case will be of that nature, you do not know, and in time of danger nothing must be taken for granted. Milk or farinaceous diet, plenty of water, or, better, Poland, Bethesda,

Seltzer, Apollinaris, or Vichy, warm bathing, warm feet, a few good doses of calomel, a number of hourly or two-hourly small doses of opium which are better than those of digitalis, and nitro-glycerine, will often prove beneficial. If a diffuse nephritis, such as is more frequently met with in scarlatina, be the result, it impairs the prognosis and requires further treatment conducted on general principles.

To what extent local treatment, if it be possible to employ it, is effective, can best be seen on external diphtheritic surfaces, thus the cutis denuded by vesicatories, the inguinal regions sore with intertrigo, the vagina, circumcision wounds, or tracheal incisions. I have tried almost everything which has been recommended for these conditions, but am most pleased with the effect of iodol, or iodoform powdered, or one part with eight or ten of vaseline. Powders of subnitrate of bismuth, boric acid, or salicylic acid with fifteen or twenty-five its quantity of starch, have not given me the same satisfaction.

Diphtheritic conjunctivitis requires also nothing but local treatment. It consists in the application of small ice-bags, or iced cloths, which must be changed every few minutes, and the frequent instillation of a saturated solution of boric acid, with or without atropia.

The local treatment of the pseudo-membranes of the fauces is a subject of great importance. To look upon them as an excretion which needs no interference, is incorrect. If it were possible to remove or destroy them, it would be a great comfort; but they can be reached only in certain places, and just in those in which they do least harm. Pseudo-membranes on the tonsils are the least dangerous, for their lymph communication with the rest of the body is very scanty. Thus almost all forms of tonsillar diphtheria are amongst the most benign, at least as long as the process does not extend. Most cases of the kind run their mild course in from five to seven days, and it is just these which have given rise to the many proposals of tearing, scratching, cauterizing, swabbing, brushing, and burning. There are cases which do not show the harm done. The fact is that neither the galvano-cautery nor carbolic acid, nor tannin and glycerine, nor perchloride or subsulphate of iron can be applied with leisure and accuracy to the very membrane alone except in the cases of very docile and very patient children. In almost every case the surrounding epithelium is getting scratched off or changed, and thus the diphtheritic deposit will spread. Besides, the membrane of the tonsil is changed surface tissue, as it always is wherever the epithelium is pavement, and not deposited upon the mucous membranes, from which it might be easily detached.



Whatever is done must be accomplished without violence of any kind. If nasal injections be found advisable, they can be made to wash the posterior pharynx and the tonsils sufficiently, so as to render the special treatment directed to the throat absolutely useless. Besides, it is easier, meets with less objection, and gives rise to less exhaustion than the forcible opening of the mouth. This is of very great importance, as I shall show in connection with the local treatment of the nasal cavity. Where it is possible to make local applications without difficulty, the membrane may be brushed with tincture of iodine several times daily, or a drop of rather concentrated carbolic acid. Of powders I know only one, the application of which is not contraindicated, viz., calomel. Even this may irritate by its very form. Everything dry irritates and gives rise to cough or discomfort. Whatever has, besides, a bad taste or odor, such as sulphur, iodoform, or quinia, must be abhorred.

For the purpose of dissolving membranes papayotin, or papain, has been employed. It is soluble in twenty parts of water, and may be injected, sprayed, or brushed on. I have used it in greater concentration, in two or four parts of water and glycerine, in the nose, throat, and through the tracheotomy tube, in the trachea. One of the irrepressible drug manufacturers and advertisers pushes the claims of some modification of the drug, which he calls papoid. For the same purpose trypsin is preferred by others. The mode of its application appears to be the reverse of indifferent. But lately I have seen, in the practice of one of our best known practitioners, papayotin applied in powder, which resulted in constant irritation of the throat while the patient otherwise was convalescent. The pharyngeal hyperæmia and slight exudation disappeared when mild alum washes were substituted.

*Steam.*—Its inhalation is useful in catarrh of the mucous membranes, and in many inflammatory and diphtheritic affections. On mucous membranes it will increase the secretion and liquefy it, and thus aid in the throwing off of the pseudo-membranes. Its action is the more pronounced the greater the amount of muciparous follicles under or alongside a cylindrical or fimbriated epithelium. Thus it is that tracheo-bronchial diphtheria, so-called fibrinous bronchitis, is greatly benefited by it. Children affected with it I have kept in small bath-rooms for days, turning on the hot water, and obliging the patient constantly to breathe the hot clouds. Several such cases I have seen recover with that treatment. Atomized *cold* water

will never yield the same result. Nor have I seen the patent inhalers do much good.

Still, where the surface epithelium is pavement rather than cylindrical, and but few muciparous follicles are present, and the pseudo-membrane is rather immersed in, and firmly coherent with, the surface—for instance on the tonsils and the vocal cords—the steam treatment is less appropriate. On the contrary, moist heat is liable in such cases to favor the extension of the process by softening the hitherto healthy mucous membrane. Thus it takes all the tact of the practitioner to select the proper cases for the administration of steam, not to speak of the judgment which is required to determine to what extent the expulsion of air from the steam-moistened room or tent is permissible.

Steam can be properly mixed with medicinal vapors. In the room of the patient water is kept boiling constantly, over the fireplace, provided the steam is prevented from escaping directly into the chimney, on a stove (the modern self-feeders are insufficient for that purpose and abominations for every reason), over an alcohol lamp if we cannot do better, not on gas, if possible, because of the large amount of oxygen which it consumes. Every hour a tablespoonful of oleum terebinthinæ, and perhaps also a teaspoonful of carbolic acid, is poured on the water and evaporated. The air of the room is filled with steam and vapors, and the contact with the sore surfaces and the respiratory tract is obtained with absolute certainty.

The secretion of the mucous membranes is sometimes quite abundant under the influence of steam, but still, like that of the external integuments, increased by the introduction of water into the circulation. Therefore, drinking of large quantities of water, or water mixed with an alcoholic stimulant, must be encouraged. Over a thoroughly moistened mucous membrane the pseudo-membrane is more easily made to float, and macerate.

It was for this purpose that pilocarpine, or jaborandi, was highly recommended. Guttmann recommended it as a panacea in all forms of diphtheria. There is no doubt that the secretion of the mucous membrane is vastly increased by its internal application, and by repeated subcutaneous injections of the muriate or nitrate of the alkaloid, but the heart is enfeebled by its use. I have seen but few cases in which I could continue the treatment for a sufficient time. In many I had to stop it because after some days of persistent administration I feared for the safety of the patients. Thus, as early as the meeting of the American Medical Association at Richmond, eight years



ago, I pointed out the exaggerations in the statements of Guttman. There will be but exceptional cases in which pilocarpine will be tolerated long enough to do good. It is one of the remedies by which we may cure our case but will kill our patient.

Diphtheria of the nose is apt to terminate fatally unless energetic treatment is commenced at once. This consists in persevering disinfection of the mucous surface. The disinfecting procedure must not be omitted long because of the general sepsis resulting from rapid absorption from the surface which is supplied with lymph ducts, and small superficial bloodvessels to an unusual extent. Disinfectant injections must be continued every hour, for one or more days. If they are well made, the consecutive adenitis, particularly that about the angles of the lower jaw, is soon relieved and the general condition improved. But there are cases in which not the lymph bodies are the main gates through which constitutional poisoning takes place, but the bloodvessels only. In the incipient stage of such cases the discharge from the nostrils is more or less sanguineous; in them the bloodvessels, thin and fragile, carry the poison inward with great rapidity.

In a few cases injections are unsuccessful. They are those in which the whole nasal cavity is filled with membranous deposits to such an extent as to require forcible treatment. Sometimes it is difficult to push a silver probe through it. That procedure may be repeated, the probe dipped in carbolic acid, or wrapped in absorbent cotton moistened with carbolic acid of 50 or 90 per cent. After a while injections alone will suffice. But now and then the development of pseudo-membranes is very rapid, a few hours suffice to block the nostrils again, and the difficulty is the same.

The liquids which are to be injected must be warm and fairly mild. Solutions of chloride of sodium, two-thirds of one per cent., saturated solutions of boric acid, one part of bichloride of mercury, 35 of chloride of sodium and 5000 of water, more or less, or lime water, or solutions of papayotin, will be found satisfactory. From the selection of these remedies it is at once apparent that the object in view is partly that of washing out, and partly of disinfecting. I have not mentioned carbolic acid, which may be used in solutions of one per cent. or less. Its employment requires care, for much of the injected fluid is swallowed, and proves a danger to children of any age, but mostly to the young.

Most of the syringes I find in my rounds are abominations. The nozzle must be large, blunt, and soft. After having recommended for many years the common hard rubber ear syringe the sharp end of

which was cut off, I now use always a short stout glass syringe with soft rubber mounting in front.

When the children cannot, or must not be raised, I employ the same solutions from a spoon, or a plain Davidson atomizer. These applications can thus be made while the children are lying down, every hour or very much oftener, without any or much annoyance. The nozzle must be large, so as to fit the nostril. A single spray on each side will generally suffice. I am in the habit of covering the common nozzle with a short piece of India-rubber tubing.

For a day or two these injections of fluids or spray must be made hourly. It is not cruel to wake the children out of their septic drowsiness; it is certain death not to do it.

Injections of the nose are oftener ordered than judiciously made. Hundreds of times have I been assured that they had been made regularly, hourly, for days in succession. Still there was a steady increase of glandular swelling and sepsis. I never believe a nurse to have made them regularly unless I have seen her doing it. They *will* run up their syringe vertically and not horizontally, the fluid *will* return through the same nostril. On the successful injecting or spraying of the nares hangs every life in a case of nasal diphtheria. I have long learned to look upon a neglect to tell at every visit how to make an injection, as a dereliction of duty. This may appear a trifling way, but it is a safe one. The nurse must be made to tell you that at every injection the fluid returns through the other nostril, or through the mouth, or is swallowed.

The procedure is simple enough, and need not take more than half a minute for both nostrils. A towel is thrown over the child's chest up to the chin and the child gently raised in bed by the person who is to make the injection. This person sitting on the bed steadies the patient's head against her chest while somebody else holds the patient's hands. The syringe is introduced horizontally by the person sitting behind the patient and gently emptied. No time must be lost in refilling and attending to the other side. When pain is complained of in the ears more gentleness is required, or the spray, or pouring in from a spoon, or minim dropper even, has to take the place of the injection.

Many sins are committed in even doing this simple thing. The unfortunate little one is made to see all the preparations and is worried and excited, and the necessary gentleness in the proceedings is neglected. The cases reported by me in a discussion on the local treatment



of diphtheria before the Section on Theory and Practice in the New York Academy of Medicine, read as follows:<sup>1</sup>

"There were two trained nurses, and two children of six and four years. When I saw the little four-year-old the other was dead. Where did he die? His head between the knees of the trained nurse. They had been told Dr. Jacobi ordered nasal injections to be made every hour in such cases. Every hour the unfortunate boy was lugged out of bed, protesting and fighting, and wearing out his little strength in his battle against two trained brutes; had his head rammed between the knees of one of them, who was herself comfortably seated on a chair, while the other did the rest; and thus the boy was murdered. When I heard that fearful story from the smiling lips of that person, I begged and pleaded, and showed her how to do it gently. A week afterward the doctor told me that the little girl died between the knees of one of the smiling creatures, and neither of them is in the State prison."

What is the concentration in which antiseptic injections should be used? For twenty-five years and more, while employing irrigations and injections frequently, I had used quite weak solutions and felt assured of their efficacy. All at once (when the gospel of bacteria was being preached) it was claimed that weak solutions were useless and a snare, because antiseptics, and particularly carbolic acid, would not destroy bacteria and bacteria-poisons except in such doses and concentrations as would necessarily destroy blood and tissues first. I felt dismayed, but still continued in my heretic ways, hoping that improved knowledge would finally harmonize theory and practice. So it happened. In the *American Journal of the Medical Sciences* for January, 1881, T. Mitchell Prudden proved that a solution of one-sixteenth of one per cent. of carbolic acid prevents the emigration of white blood-corpuscles under circumstances otherwise favorable to inflammation, and Koch found that though bacteria are not easily killed, their growth is stopped by a solution of one part of carbolic acid in 850, and their activity by one in 1200. These effects are all that is required for practical purposes; thus the frequency of applications is justified by both necessity and safety.

Diphtheritic adenitis, the swelling of the cervical glands near the angles of the lower jaw, to which I have alluded as an ominous symptom, points to nasal and nasopharyngeal infection. The treatment consists in disinfection of the absorbing surfaces.

Direct local treatment of the glands, if not entirely useless, is, at all events, of minor importance and efficiency. Applications of one part of carbolic acid to ten of alcohol, irritate both surface and patient more than they can do good. Inunctions may do some good by fric-

<sup>1</sup> N. Y. Medical Record, 1887, p. 403.

tion (massage); inunctions with some absorbable material in them may do a little better. The common iodide of potassium ointment is useless; iodide of potassium in three or five parts of glycerine is more readily absorbed; the same in equal parts of water, with a little animal fat, and six or eight times its quantity of lanolin, gives an ointment which is readily absorbed. Iodine is found in the urine within a few hours. Iodoform may be utilized in the same way. Injections of iodoform in ether, which I suggested some time ago, are too painful. Mercurial inunctions, those of blue ointment, require too much time for any effect to take place. Oleates are too irritating locally; a lanolin ointment would prove more satisfactory. After all, however, the readiest method of reducing the swelling of the glands, and improving the prognosis accordingly, is that of cleansing and disinfecting the field of absorption. The rare cases of suppuration in these glands require incision and disinfection. They are as ominous as rare, however. There is but little pus, as a rule, but one or many local deposits of disintegrated gland cells and gangrenous connective tissue. The incisions must be extensive, the scoop and concentrated carbolic acid must be freely used. In these cases hemorrhages may occur, some of them very difficult to manage. I have seen some of them terminate fatally. In these carbolic acid must be avoided. Compression, actual cautery, and acupressure, have rendered good service. Solutions of iron must be avoided, for the scurf formed is a shield behind which deleterious absorption is going on constantly in such wounds, as it does in the uterus.

Besides sepsis, the great dangers in diphtheria are heart failure and strangulation. The latter has its own indication, to which I shall not allude to-day. Heart failure exhibits itself sometimes quite suddenly; but, as a rule, it is foreshadowed by a gradually increasing frequency, weakness of heart-beats and pulse, and the equal length of the intervals between the feeble systole and diastole, and diastole and systole. This equality is always a dangerous symptom. Heart failure is due, besides the influences common to every disease and every fever, to myocardial changes. These may depend on the influence of the septic decomposition of the blood, and the ill nutrition of the heart-muscle depending thereon, or the direct diphtheritic changes of the tissue, or both. These changes and dangers set in, sometimes, at a very early period. Thus, whatever enfeebles must be avoided. Patients must be spared every unnecessary activity. They must remain in bed, without excitement of any kind, take their meals, and evacuate their bowels in a recumbent or semi-recumbent position; crying and worrying must be



avoided; the room kept airy, and rather dark, so as to encourage sleep if the patient be restless. In no disease, except, perhaps, in pneumonia, have I seen more fatal results from sudden changes of posture, or from exertion. Unless absolute rest be enforced, neither physician nor nurse has done his or her duty.

The threatening feebleness of the heart yields a positive therapeutical indication. In no disease is the danger greater from the side of the heart, in no disease is the indication for sustaining and strengthening the heart more positive from the very beginning. Digitalis, strophanthus, spartein, besides camphor, alcohol, and musk, must not be postponed until feebleness and collapse have set in. It is possible or probable that they will appear; and it is certain that a cardiac stimulant will do no harm. It is safe, and advisable to use them at an early date. That is particularly necessary when antipyrin or antifebrin is given. A few grains of digitalis, in a palatable and digestible form, may, or must, be given daily. When a speedy effect is required, one or two doses of from two to four grains are not too large, and must be followed by smaller ones. When it is justly feared that the effect of digitalis may be too slow, I give, with or without the former, sulphate of spartein. An infant a year old will take one-tenth of a grain four times a day, as a matter of precaution, and every hour or every two hours in an emergency.

Of at least the same importance as cardiac tonics are alcoholic stimulants. The advice to wait for positive symptoms of heart failure and collapse before the life-saving apparatus is employed, is bad. There are cases which get well without treatment, but we do not know beforehand which they will be. No alleged mild case is safe until it has recovered. When heart failure sets in—and often it will occur in apparently mild cases—our efforts are too often in vain. Thus alcoholic stimulants ought to be given early, and in large quantities, though amply diluted. There is no such thing as intoxication or danger from it, in septic diseases. A few ounces daily may suffice, but I have seen ten ounces daily of brandy or whiskey to save children who had done badly with three and four.

Coffee is a good stimulant for the heart. Camphor may be employed to great advantage for the same purpose. From five to twenty-five grains may be given daily, as camphor water, or in a mucilaginous emulsion, which is easily taken. It does not upset the stomach as ammonium carbonate is liable to do. It may be employed subcutaneously when a rapid effect is aimed at, in five parts of oil, which is milder and more convenient than ether.

But the best internal stimulant, in urgent cases, is Siberian musk, in powder or with mucilage. When required at all, it ought to be given in sufficient doses and at short intervals. When ten or fifteen grains administered to a child one or two years old, will not accomplish, within three or four hours, a return of a more satisfactory heart's action, the prognosis is very bad.

Besides exhaustion at the height of the disease, we have paralysis during convalescence, or intense anæmia long after apparent recovery. This anæmia may be general, or is local, and then mostly cerebral.

Diphtheritic paralysis, though of different anatomical and histological origin, yields in all cases a certain number of identical therapeutical indications. These are: the sustaining of the strength of the heart by digitalis and other cardiac tonics. A child of three years may take daily, for a month, three grains or its equivalent; for instance, one grain of the extract. This is an indication on which I cannot dwell too much. Many of the acute, and most of the chronic diseases of all ages, do very much better by adding to other medications a regular dose of a cardiac tonic. It is true that it is a good practice to follow the golden rule to prescribe simply, and, if possible, a single remedy only, but a better one to prescribe efficiently. A prescription paper with a single line on it looks well, but a readily convalescent or well man looks better.

Besides, there are some more indications: mild preparations of iron, provided the digestive organs are not interfered with. Strychnia or other preparations of nux at all events. In ordinary cases a child of three years will take an eightieth of a grain three or four times a day. Local friction, massage of the throat, of the extremities, and trunk, dry or with hot water or oil, or water and alcohol; and the use of both the interrupted and continuous currents, according to the known rules, and the locality of the suffering parts, find their ready indications. The paralysis of the respiratory muscles is quite dangerous; the apnoea resulting from it may prove fatal in a short time. In such cases the electrical current used for very short periods, but very frequently, and hypodermatic injections of sulphate of strychnia in more than text-book doses, and frequently repeated, will render good service. I remember a case in which these, and the occasional use of an interrupted current, and occasional artificial respiration by Silvester's method, persevered in for the better part of three days, proved effective.

*Chloride of Iron.*—I am still, as I was in my first paper on diphtheria, in 1860, an advocate of the internal use of chloride of iron.



Its mode of administration I have not changed much these twenty years. At a public lecture delivered before a New York audience, by an European authority, whose name has lately appeared a little more prominently in the newspapers than an American physician would wish, I was highly praised for giving a few drops of the tincture of the chloride of iron a few times a day. This eulogy I have always tried not to deserve, for the efficient method of its administration is not that. The chloride of iron is an astringent and antiseptic. Its contact with the diseased surface is as important as is its general effect; therefore it must be given frequently, in hourly or half hourly doses, even every twenty or fifteen minutes. An infant of a year may take three or four grammes a day, a child of three or five years eight or twelve. It must be mixed with water to such an extent that the dose is half a teaspoonful or a teaspoonful; a drachm in four ounces allows half a teaspoonful every twenty minutes. No water must be drank after the medicine. As a rule, it is well tolerated. There are some, however, who will not bear it well. Vomiting or diarrhoea is a contraindication to persevering in its use, for nothing must be allowed to occur which reduces strength and vigor. A good adjuvant is glycerine, better than syrups. From ten to fifteen per cent. of the mixture may consist of it. Now and then, but rarely, it is not well tolerated neither. When diarrhoea sets in glycerine must be discontinued. Still, these cases are rare; indeed, the stomach bears glycerine very much better than the rectum. In the latter, the presence of a small dose of glycerine is known sometimes to produce large evacuations, a result appropriated and utilized by an advertising nostrum monger.

In connection with this remedy, I wish to make a remark of decidedly practical importance. I know quite well that recovery does not always prove the efficacy of the remedy or remedies administered. But I have seen so many bad cases recover with chloride of iron, when treated after the method detailed above, that I cannot rescind former expressions of my belief in its value. Still, I have often been so situated that I had to give it up in peculiar cases. These are such in which the main symptoms are those of intense sepsis, I should say such in which the iron and other rational treatment was not powerful enough to prevent the rapid progress of the disease. Children with naso-pharyngeal diphtheria, large glandular swelling, feeble heart and frequent pulse, thorough sepsis, and irritable stomach besides, those in which large doses only of stimulants, general and cardiac, can possibly promise any relief, are better off without the iron. When the

circumstances are such as to leave the choice between iron and alcohol, it is best to omit the iron and rely on stimulants mostly. The quantities required are so great that the absorbent powers of the stomach are no longer sufficient for both.

Nor is iron sufficient or safe in those cases which are preëminently laryngeal. To rely on iron in membranous croup means waste and danger.

*Mercury.*—The first volume of *A System of Practical Medicine by American Authors*, which appeared in 1885, contains, in an article on diphtheria, written in 1884, the following remarks on page 705 :

“Not all cases of diphtheria are septic or gangrenous, nor are all the cases occurring during an epidemic of the same type. Some have the well-pronounced character of a local disease, either on the tonsils or in the larynx. The cases of sporadic croup met with in the intervals between epidemics present few constitutional symptoms, and assume more the nature of an active inflammatory disease, very much like the sporadic cases of fibrinous tracheo-bronchitis. These are the cases in which mercury deserves to have friends, apologists, and even eulogists. Calomel, 0.5–0.75 gramme (grs. viij–xij), divided into thirty or forty doses, one of which is taken every half hour, is apt to produce a constitutional effect very soon. Such, with minute doses of one milligramme (gr.  $\frac{1}{60}$ th) or more, of tartar emetic, or ten or twenty times that amount of oxysulphuret of antimony, have served me well in acute fibrinous tracheo-bronchitis. But the mucous membrane of the trachea and bronchi is more liable to submit to such liquefying and macerating treatment than the vocal cords. The latter have no muciparous glands like the former, in which they are very copious. And while the tracheal pseudo-membrane, though recent, is apt to be expelled through a tracheal incision at once, that of the vocal cords takes from six days to sixteen or more for complete removal. Still, a certain effect may even here be accomplished, for maceration does not depend only on the local secretion of the muciparous glands, but on the total secretion of the whole surface, which is in constant contact with the whole respiratory tract. Thus, either on theoretical principles, or on the ground of actual experience, men of learning and judgment have used mercury in such cases as I detailed above, with a certain confidence.”

“If ever mercury is expected to do any good in cases of suffocation by membrane, it must be made to act promptly. This is what the blue ointment does not. In its place I recommend the oleate, ten or twelve minims of which may be rubbed into the skin along the inside of the forearms or thighs, or anywhere else when those surfaces become irritated, every hour or two hours. Or repeated doses will be useful such as mentioned before, or hypodermic injections of corrosive sublimate, in one-half or one per cent. solution in distilled water, four or five drops from four to six times a day or more, either by itself or in combination with the extensive use of the oleate, or with calomel internally. Lately, the cyanide of mercury has been recommended very strongly. I hardly believe that it will work more satisfactorily than any other equally soluble preparation. Within the past few years the



internal administration of bichloride of mercury has been resorted to more frequently and with greater success than ever before.

"My own recent experience with it has been encouraging, and so has that of some of my friends. Wm. Pepper gave one thirty-second of a grain of corrosive sublimate every two hours in a bad form of diphtheritic croup, with a favorable result. But in this very bad case, desperate though it was—child of five years, respiration 70, pulse 160—large membrane 'evidently from the larynx' had been expelled before the treatment was commenced on the seventh day of the disease. The solution ought to be given in solution of 1:5000 and in good doses. A baby a year old may take one-half grain every day many days in succession, with very little, if any, intestinal disorder, and with no stomatitis. A solution of the corrosive sublimate in water is frequently employed of late as a disinfectant. It acts as such in a dilution of 1 in 20,000. As healthy mucous membrane bears quite well a proportion of 1:2000 or 3000, any strength between these extremes may be utilized. A grain of the sublimate in a pint or more of water, with a drachm of table salt will be found both mild and efficient. As a gargle and nasal injection it will be found equally good. But it has appeared to me that frequent applications give rise to a copious mucous discharge; hourly injections into a diphtheritic vagina become quite obnoxious by such over-secretion, which ceases at once when the injections are discontinued. Thus, when it is desirable not only to disinfect, but also to heal the diseased surface, the injections with corrosive sublimate appear to yield a result inferior to less irritating applications."

These remarks of 1884 constitute what I consider a great progress over the statements of my treatise on diphtheria, 1880, which are more cautious and negative. Extensive experience with the remedy increased my favorable opinion of its efficiency to such an extent as to induce me to publish a number of cases and conclusions in the *Medical Record* of May 24, 1884.

They have been amply justified by the observations of the last four years, so that I am fully prepared to commit myself to the following statements: My conviction of the utter uselessness of internal medication in laryngeal diphtheria, membranous croup, is strongly shaken. The mortality of 90 or 95 per cent. of the cases not operated upon has no longer existed these five or six years, in my observation. The above figures were by no means taken from small numbers. For since 1860 I have tracheotomized more than 500, perhaps 600, times, have assisted in as many more operations, and seen at least a thousand cases of membranous croup which were not operated upon at all. During the last six years I have seen no less than 200 cases, perhaps many more. Amongst them, recoveries have not been rare. In the practice of no less a man than O'Dwyer, I have seen two cases of general and laryngeal diphtheria in the same family which got well without any operative procedure. Such recoveries have taken place

in all ages, from four months upward. The uniform internal medication consisted in the administration of the bichloride of mercury. The smallest daily dose was a quarter of a grain (15 milligrammes). Half a grain daily continued through five or six, sometimes eight, ten, or even twelve days, has not been rare amongst children of from three to six years. The doses varied from one-sixtieth to one-fortieth of a grain, and sometimes more. They are given every hour. They require dilution in a tablespoonful of water, or other compatible fluid, for instance milk, in order to be quite innocuous. They are not liable to produce gastric or intestinal irritation. When the latter occurred, it was generally found that by some mistake the solution was as strong as 1:2000 or 1:3000. In the few cases in which it did exist, or was believed to result from the remedy, a few minims of camphorated tincture of opium administered with every dose, for a short period, proved sufficient to check it. The beneficial effect of the remedy depends greatly on the time of its administration. As a rule, such complete stenosis as necessitates surgical interference, develops after days only. This necessity is often obviated by the remedy when given as detailed. When an operation is required after all, the treatment must be continued. I have never since 1863 seen so many cases of tracheotomy getting well as between 1882 and 1886, when the bichloride was constantly used as mentioned. Nor am I alone with these observations. I can name a dozen of New York physicians, some of whom have often performed tracheotomy, who can confirm the above statements from their own observations. Nor does the opinion of those differ who constantly perform intubation. I know that O'Dwyer, Dillon Brown, and Huber have come to the same conclusions, the latter having been a successful tracheotomist before he earned his laurels with intubation.

My experience in regard to the efficacy of the bichloride of mercury is mainly gathered in cases of laryngeal diphtheria, and a limited number of fibrinous bronchitis. It is there where it has been particularly effective. Still, I must not say that they were localized affections. These, with us, are but very scarce. Our cases of diphtheritic laryngitis are mostly decreasing, and complicated with either diphtheritic pharyngitis, or rhinitis, or both. Not a few, mainly of the latter kind, exhibit constitutional symptoms, sepsis. But cases of that kind also I have seen getting well. One of the most interesting was that of a girl of seven years whom I saw a single time in consultation with Dr. J. Anderson. There were nasal and pharyngeal diphtheria, cervical adenitis, and some laryngeal stenosis. I recommended



an hourly dose of one-fortieth of a grain of bichloride, which she took for ten days, also nasal injections of the same, one grain to a pint. They were made hourly for many days, and altogether continued for more than a fortnight, for the patient lived so long, and is still alive. She swallowed almost all the nasal injections, and great was my surprise when, after some weeks, I received the report of the case and learned that about twenty grains of the bichloride had found their way into the stomach of the little girl. She lived, had but little stomatitis, and hardly any intestinal irritation. If the case does not prove anything else, it proves this, that even desperate cases will get well; this case got well with the bichloride of mercury, and resembles all the other cases in this, that after the rational and careful administration of solutions of hydrargyrum bichloride, local mercurial symptoms about gums, mouth, pharynx, and intestines are extraordinarily rare in infancy and childhood.







